US005839877A

United States Patent [19]

Kikuchi et al.

[11] **Patent Number: 5,839,877**

[45] **Date of Patent: Nov. 24, 1998**

[54] **SUCTION HOLDING ASSEMBLY FOR LEAD FRAMES**

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[21] Appl. No.: **677,511**

[22] Filed: **Jul. 10, 1996**

[30] **Foreign Application Priority Data**

Jul. 13, 1995 [JP] Japan 7-199311

[51] **Int. Cl.**[6] **B65G 59/04**

[52] **U.S. Cl.** **414/797**; 414/749; 901/40; 294/65.5

[58] **Field of Search** 901/40, 16; 414/900, 414/796.9, 797, 749; 294/65.5

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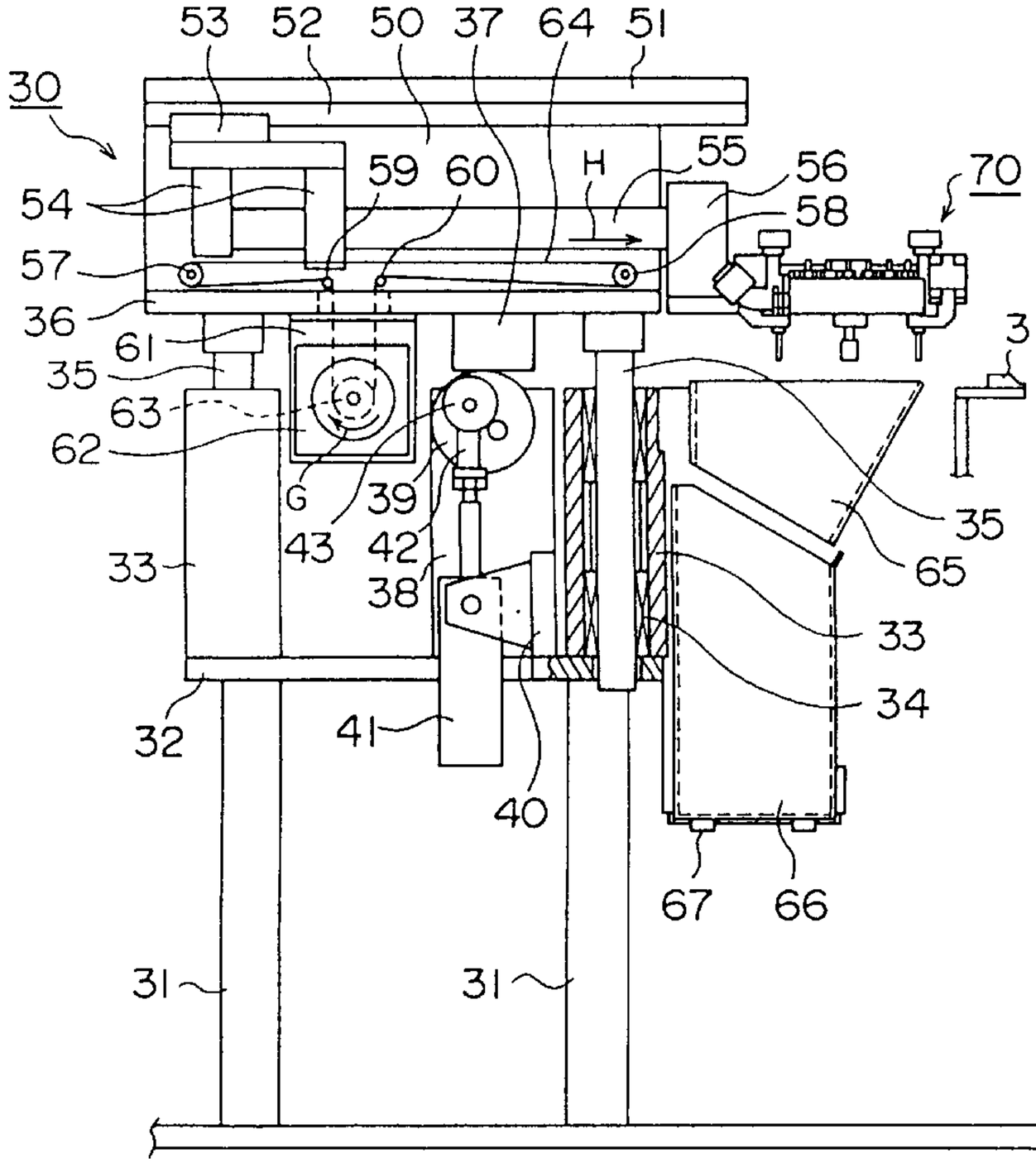
Primary Examiner—Karen M. Young
Assistant Examiner—Gregory A. Morse
Attorney, Agent, or Firm—Koda & Androlia

[57] **ABSTRACT**

A device for picking up, via suction, a lead frame from a lead frame magazine and placing it on a guide rail so that the lead frame is fed to a bonding machine. This device includes a plurality of lead frame suction nozzles disposed in at least two parallel rows such that one row of the two parallel rows of the lead frame suction nozzles is movable toward and away from an other row of the lead frame suction nozzles. In addition, the lead frame suction nozzles in each of the two rows can be moved closer to and away from each other within each of the rows.

6 Claims, 5 Drawing Sheets



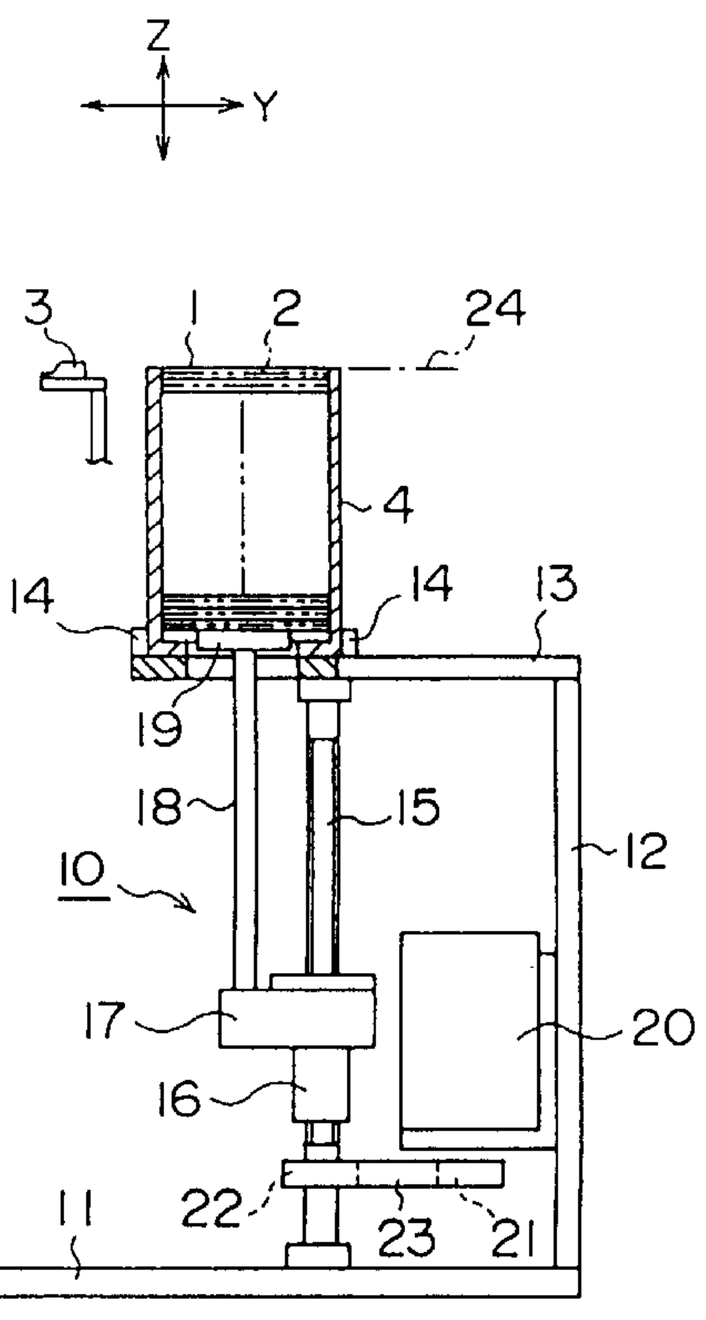
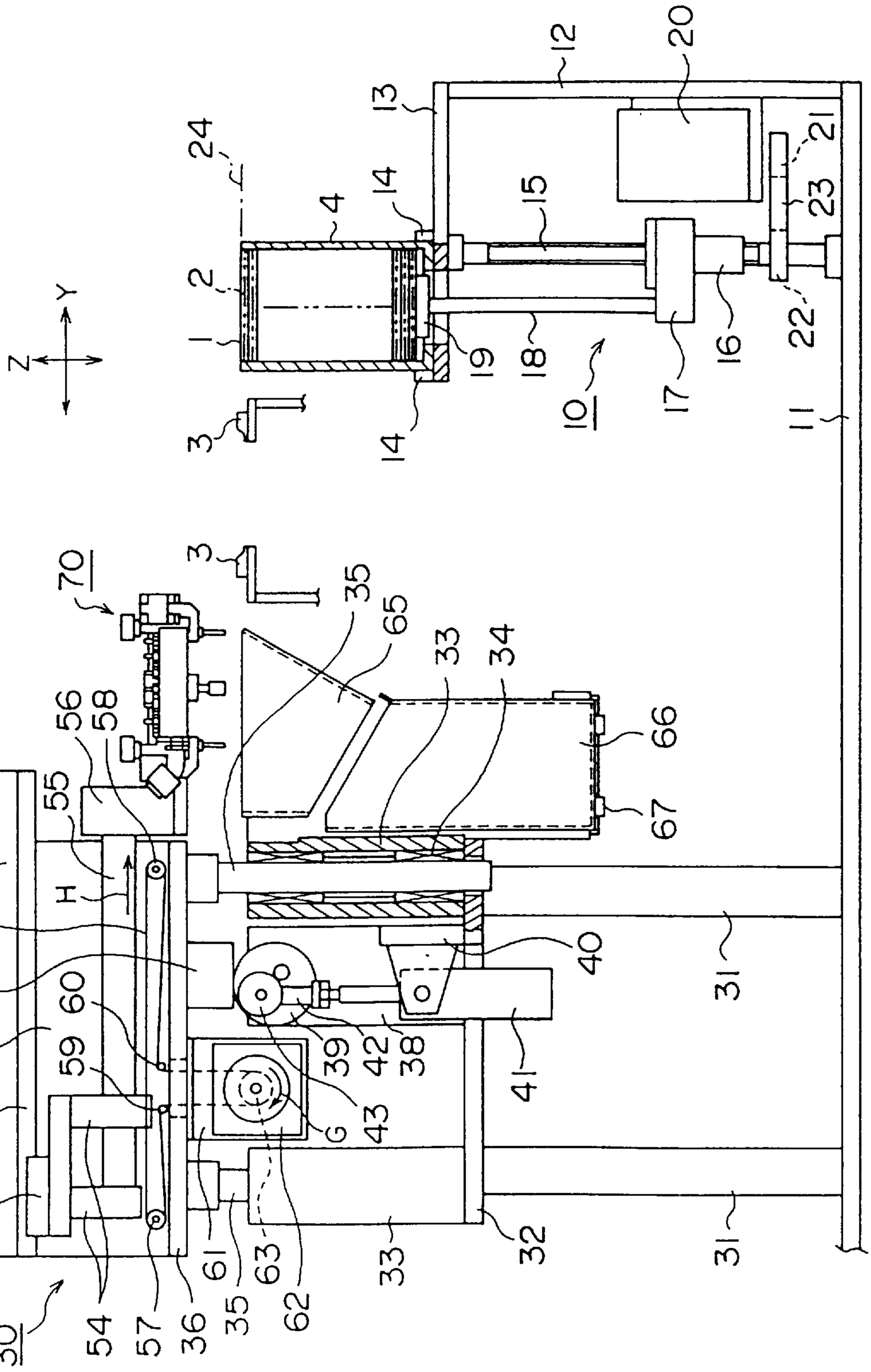


FIG. 1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Y
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70
3
35
65
33
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56
58
66
55
67
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H
64
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37
60
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G
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53
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3
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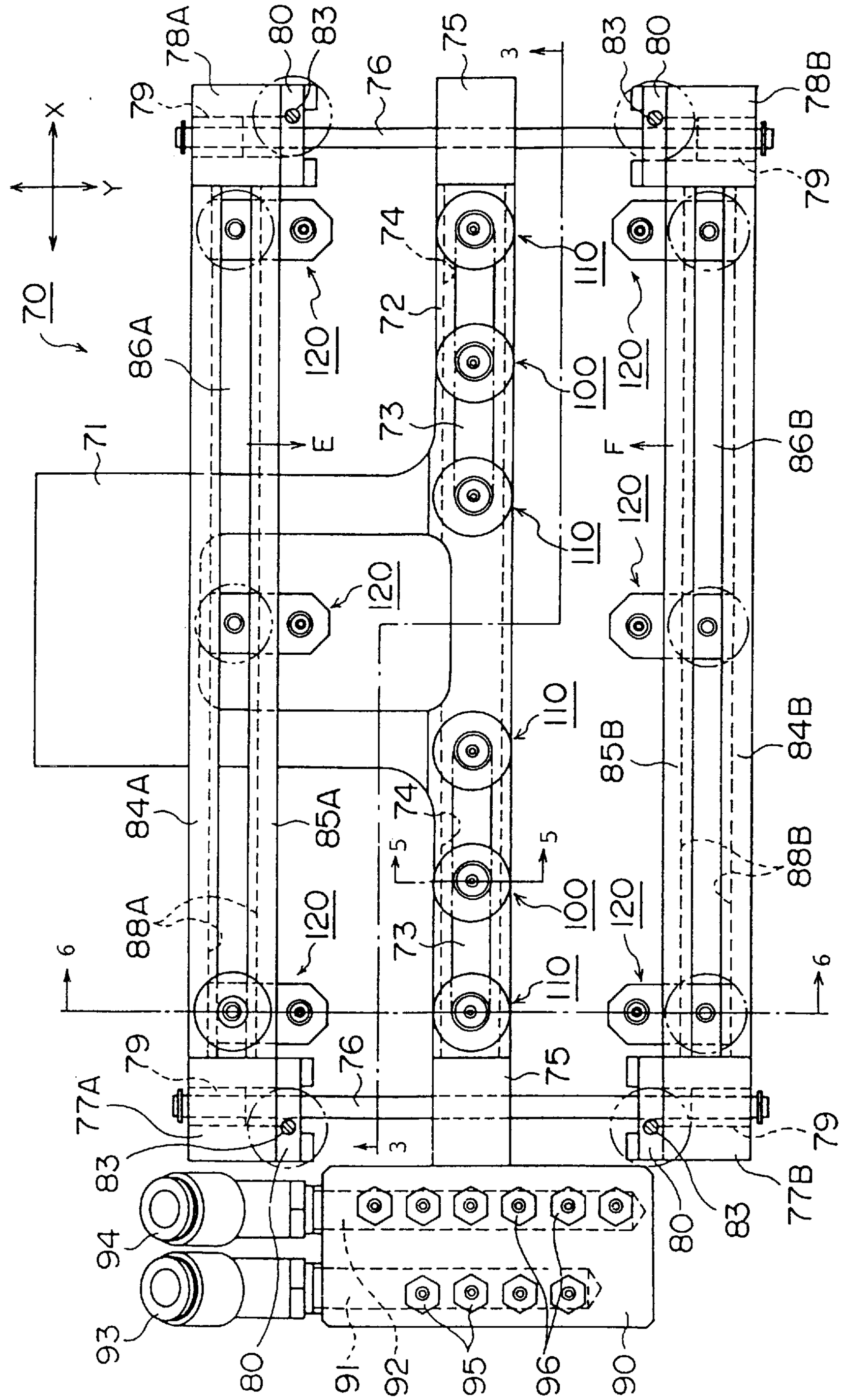
63
62


78A
80
83
75
3
83
80
78B
79
76
X
Y
70
74
110
72
120
86A
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120
73
E
F
71
110
120
120
86B
110
85B
84B
84A
85A
74
5
5
88B
88A
120
100
120
73
6
6
110
79
76
75
77A
3
79
83
77B
80
83
94
93
80
91
92
95
96
90

FIG. 2

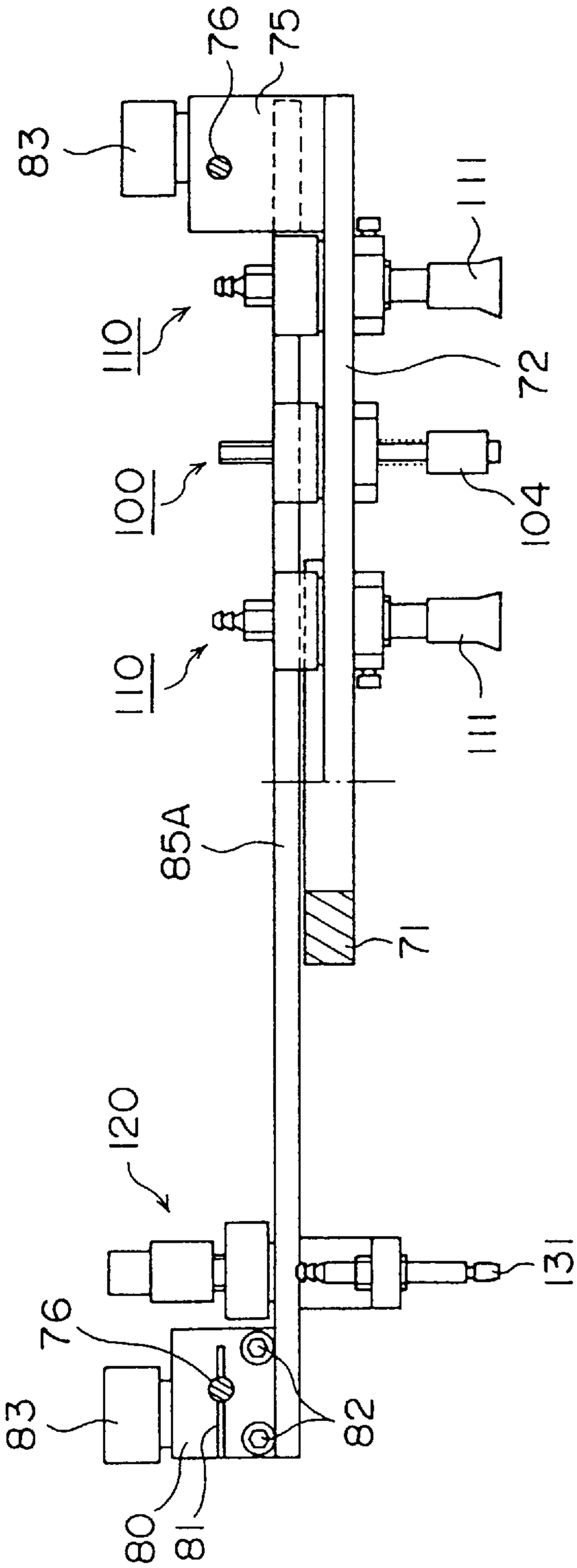


FIG. 3

FIG. 4

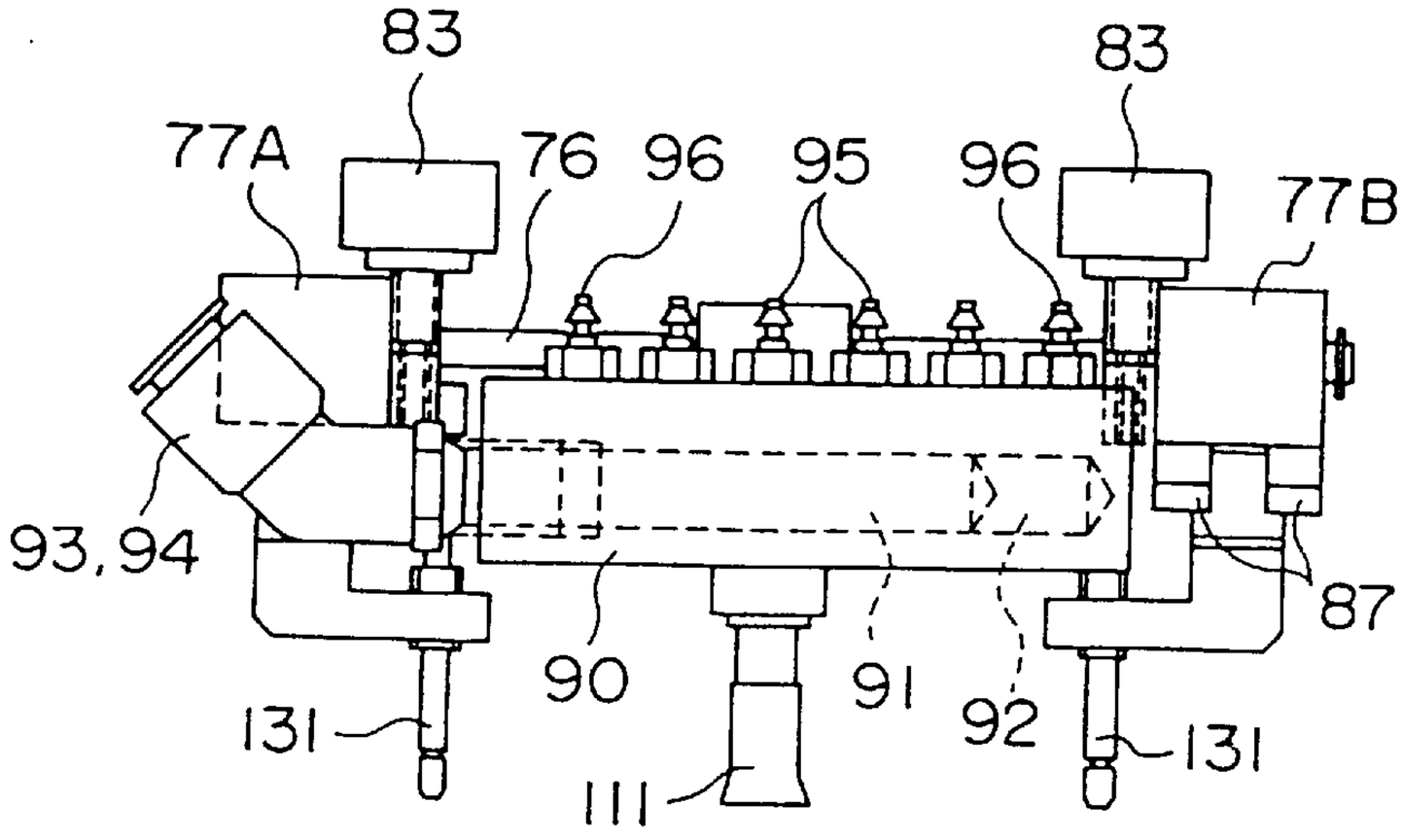

83
83
77A
76
96
95
96
77B
93,94
87
90
91
92
131
131
111

FIG. 5

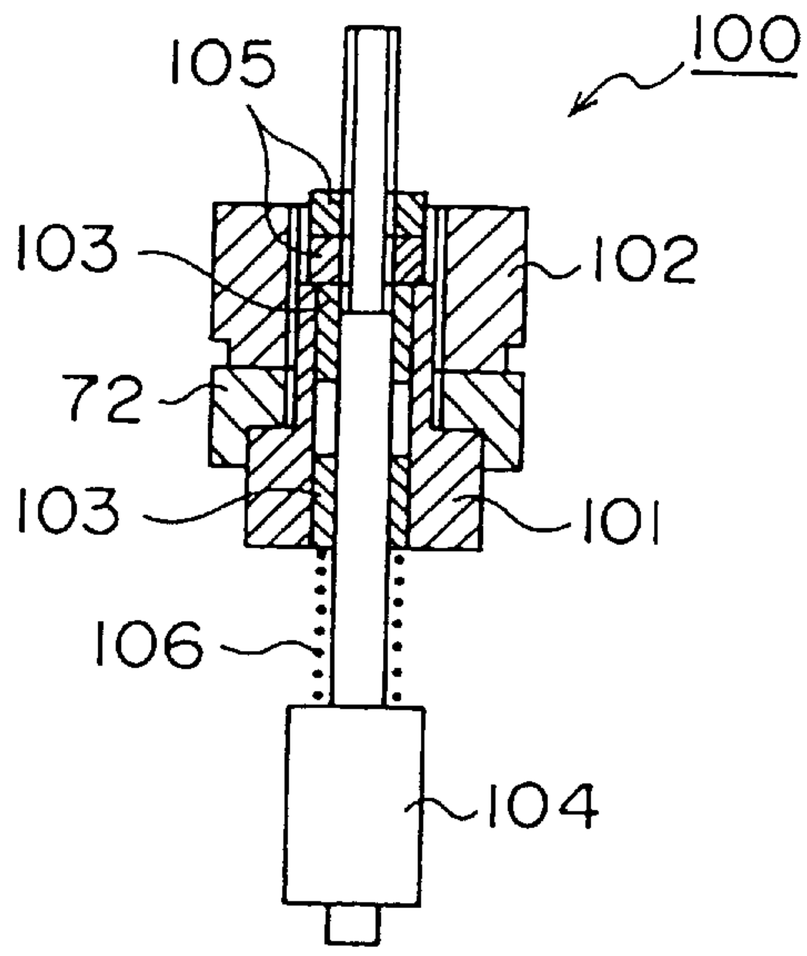

100
105
103
102
72
103
101
106
104

FIG. 6

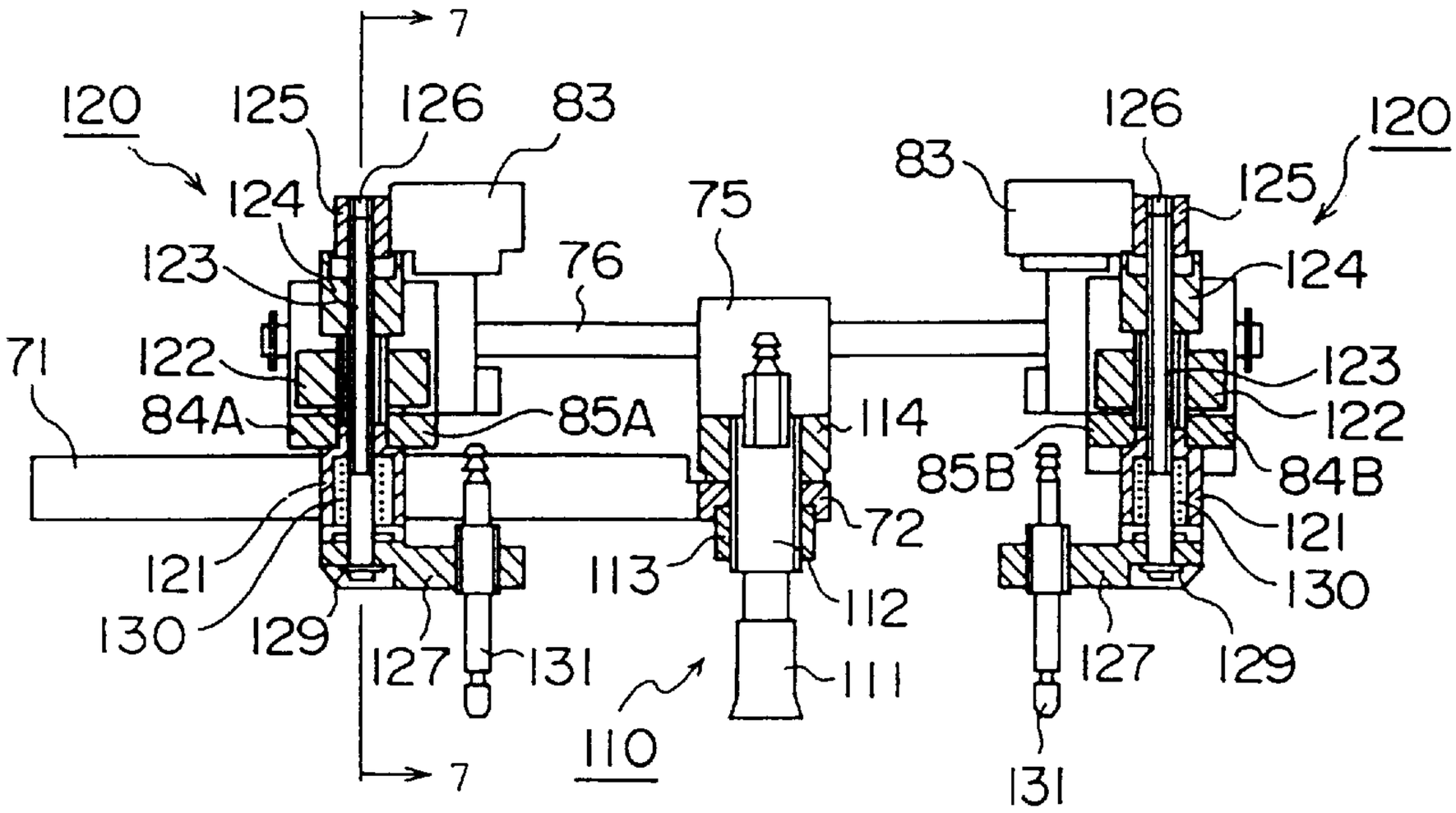
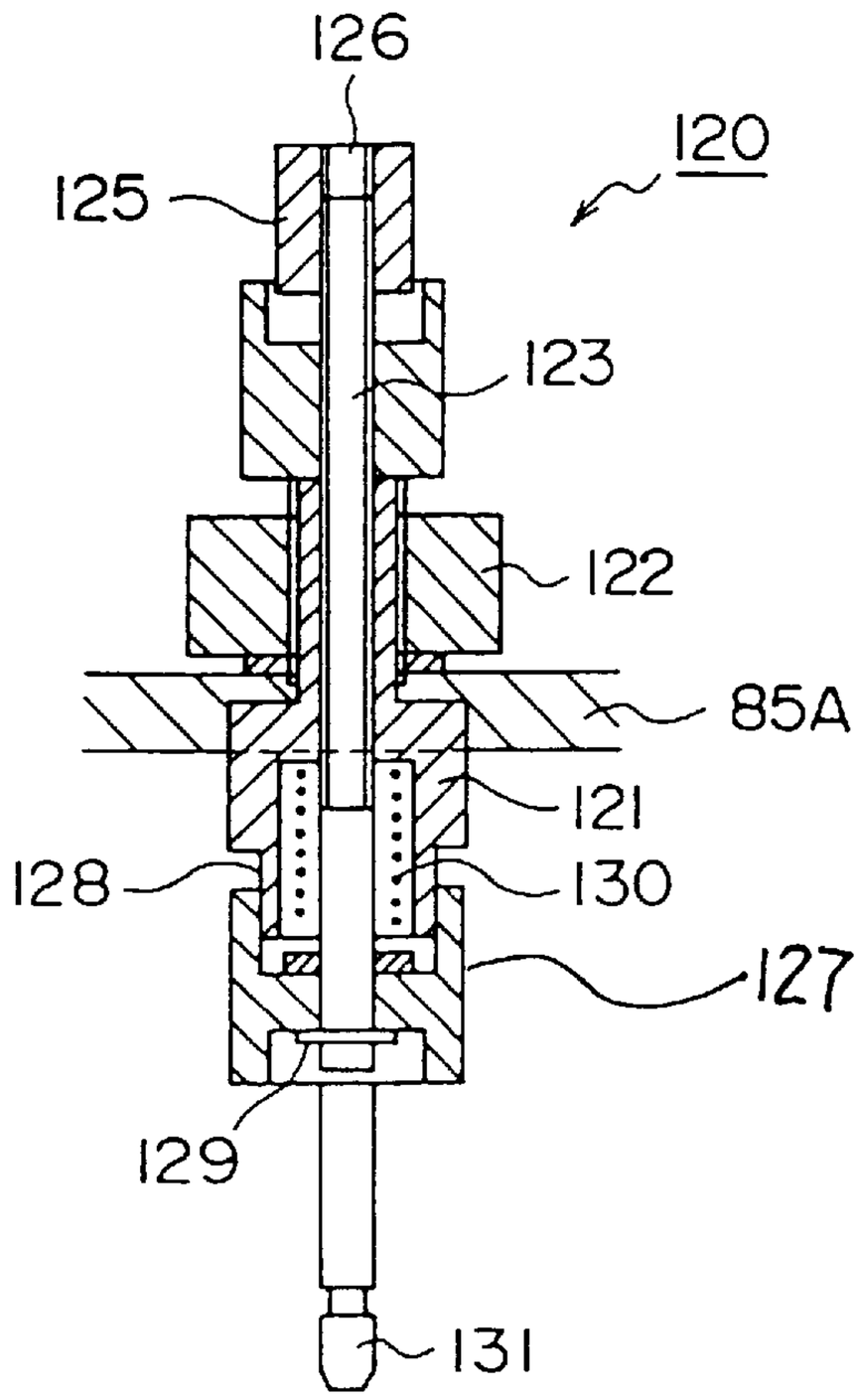

7
120
125
126
83
124
123
76
75
71
122
84A
85A
114
85B
72
121
113
112
130
129
127
131
111
110
7

FIG. 7


126
120
125
123
122
85A
121
128
130
127
129
131

SUCTION HOLDING ASSEMBLY FOR LEAD FRAMES

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a suction holding assembly for lead frames used in lead frame supply/discharge devices.

2. Prior Art

For example, in die bonding performed on lead frames, lead frames which are stacked in a lead frame magazine are taken out one by one by being held by suction via a plurality of suction nozzles of a suction holder and placed on guide rails. Then, the lead frames which have been placed on the guide rails are conveyed to the bonding area of a bonding apparatus by a lead frame feeding means such as a pusher, feeding pawls, etc. while being guided by guide grooves formed in the guide rails.

A lead frame supply/discharge device of this type is disclosed in, for example, Japanese Patent Application Kokai (Laid-Open) No. 62-175324.

In the lead frame suction holding assembly of this prior art, a plurality of lead frame suction nozzles are installed in a single row on the lead frame suction holder so that the central portion of the lead frame in the direction of the length of the lead frame is held by suction attachment. However, since a punched-out space is formed in the central portion of the lead frame, and since leads are formed in this space, it is not desirable to hold the central portion of the lead frame by suction. In addition, in the case of a wide lead frame, holding the lead frame by the central portion alone may cause problems in terms of stability.

Furthermore, in the prior art device described above, respective suction holding assemblies are constructed for each type of product to be handled. Accordingly, in cases where the length or width of the lead frames are changed due to a change in the type of product to be handled, the suction holding assembly must be replaced by another type of device which meets the new type of product to be handled. As a result, a separate suction holding assembly must be provided for each type of product to be handled, and there are problems in terms of device storage control and economy, etc.

SUMMARY OF THE INVENTION

Accordingly, the primary object of the present invention is to provide a suction holding assembly for lead frames which allows stable suction holding of lead frames without causing any scratches to the lead surfaces of the lead frames.

It is another object of the present invention to provide an all-purpose suction holding assembly for lead frames which can handle various types of products.

The objects of the present invention are accomplished by a unique structure for a suction holding assembly which picks up lead frames which are accommodated inside a lead frame magazine by suction and then places them on guide rails, and the unique structure of the present invention is that the suction holding assembly includes a plurality of lead frame suction nozzles which are disposed in two rows on a suction holder which is moved in the vertical direction and in the horizontal Y direction perpendicular to the X direction. In this structure, the X direction is the length-wise direction of the guide rails along which the lead frames are conveyed, and both edge portions of each lead frame with

respect to the direction of length of the lead frame are held by suction effected by the suction nozzles.

The present invention provides another unique structure for the suction holding assembly described above, and the unique structure of the present invention is that the plurality of lead frame suction nozzles installed in two rows are provided so that not only are the positions of the suction nozzles in the direction of width of the lead frame adjusted by moving the respective rows of suction nozzles in the direction of width of the lead frame but also the position of the suction nozzles in the direction of length of lead frame is adjusted by moving the suction nozzles in the direction of length of the lead frame.

The present invention provides a further unique structure for the suction holding assembly above described above, and the unique structure is that the central portions of a pair of Y direction shafts which extend in the Y direction are respectively fastened to both sides of a suction holder (with respect to the X direction), a pair of sliding blocks are installed on both ends of each one of the two Y direction shafts so that the sliding blocks can slide on the Y direction shafts and then be positionally fastened to the Y direction shafts, X-direction guide plates which extend in the X direction are fastened to the respective pairs of sliding blocks facing each other in the X direction, and the plurality of lead frame suction nozzles are installed on the X-direction guide plates so that the suction nozzles can slide on these guide plates and then be positionally fastened to these guide plates.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a partially sectional side view which illustrates one working configuration of a lead frame supply/discharge device which includes a suction holding assembly for holding lead frames according to the present invention;

FIG. **2** is a top view of the suction holding assembly shown in FIG. **1**;

FIG. **3** is a sectional view taken along the line **3**—**3** in FIG. **2**;

FIG. **4** is a side view of FIG. **2**,

FIG. **5** is a sectional view taken along the line **5**—**5** in FIG. **2**;

FIG. **6** is a sectional view taken along the line **6**—**6** in FIG. **2**; and

FIG. **7** is a sectional view taken along the line **7**—**7** in FIG. **6**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Below, an optimal working configuration of the present invention will be described with reference to FIGS. **1** through **7**.

In FIG. **1**, the reference numeral **10** refers to an elevator device which is used with lead frame suction holding assembly **70** with a pair of guide rails **3** and **3** in between. The suction holding assembly **70** is provided on the suction holding assembly driving device **30**.

The elevator device **10** positions and holds a lead frame magazine **4** which is positioned on the front side (right side in FIG. **1**) of the pair of guide rails **3** which guide the lead frames **1**. The lead frame magazine **4** accommodates the lead frames **1** and papers **2**. The lead frames **1** and papers **2** are stacked in an alternating configuration in the lead frame magazine **4**, so that damage to the circuit surfaces that would be caused by contact between adjacent lead frames **1** is prevented.

In the elevator device **10**, positioning plates **14** which position the lead frame magazine **4** are installed on the magazine carrying plate **13** of an elevator device frame that is comprised of a base plate **11**, a side plate **12** and the magazine carrying plate **13**. The upper and lower ends of a screw shaft **15** are supported between the base plate **11** and the magazine carrying plate **13** so that the screw shaft **15** is rotatable. Furthermore, the upper and lower ends of two rotation-preventing shafts (not shown) are fastened to the base plate **11** and magazine carrying plate **13**. An up-and-down block **16** having an inner thread therein is engaged with the screw shaft **15**, and a raising-and-lowering shaft holder **17** which is fitted over the rotation-preventing shafts so that the raising-and-lowering shaft holder **17** can move upward and downward is fastened to this up-and-down block **16**. A raising-and-lowering shaft **18** which extends upward through the magazine carrying plate **13** and the bottom plate **5** of the magazine **4** is fastened to the raising-and-lowering shaft holder **17**, and a push-up plate **19** is fastened to the upper end of the raising-and-lowering shaft **18**.

A motor **20** is mounted to the side plate **12**, and a first timing pulley **21** is coupled to the output shaft of the motor **20**. A second timing pulley **22** is fastened to the screw shaft **15** so as to face the first timing pulley **21**, and a timing belt **23** is installed between the timing pulley **21** and timing pulley **22**. The reference numeral **24** denotes the nozzle suction position for suction-holding the lead frames **1**.

In the following description, the direction along the length of the guide rails **3** will be referred to as the "X direction", the horizontal direction perpendicular to the X direction will be referred to as the "Y direction", and the vertical direction will be referred to as the "Z direction".

On the back side (left side in FIG. **1**) of the guide rails **3**, the suction holding assembly driving device **30** is provided which causes the suction holding assembly **70** to move in the Z and Y directions.

In this suction holding assembly driving device **30**, two bearing holders **33** are fastened to a fastening plate **32** which is provided on the upper ends of four supporting legs **31**, and raising-and-lowering shafts **35** are provided in the bearing holders **33** with bearings **34** (only one shown) in between so that the shaft **35** is moved up and down. A raising-and-lowering plate **36** is fastened to the raising-and-lowering shafts **35**, and an actuating plate **37** is fastened to the undersurface of this raising-and-lowering plate **36**.

A cam supporting plate **38** is fastened to the fastening plate **32**, and a cam **39** is rotatably provided on the cam supporting plate **38** so that the actuating plate **37** presses against the cam **39**. A cylinder supporting plate **40** is fastened to the side surface of one of the bearing holders **33**, and an air cylinder **41** is supported on the cylinder supporting plate **40** so that the air cylinder **41** is tiltable. A pin **43** is rotatably provided on a connecting shaft **42** which is fastened to the operating rod of the air cylinder **41**, and this pin **43** is fastened to the cam **39**.

A side plate **50** is provided on the raising-and-lowering plate **36**, and a rail supporting plate **51** is fastened to the side plate **50**. A rail **52** which extends in the Y direction is fastened to the undersurface of the rail supporting plate **51**, and a guide plate **53** is attached to the rail **52** so that the guide plate **53** slides along the rail **52**.

A Y-direction moving shaft holder **54** is fastened to the guide plate **53**, and one end of a Y-direction moving shaft **55** which extends in the Y direction is fastened to the Y-direction moving shaft holder **54**. A suction holding assembly holder **56** is fastened to the other end of the Y-direction moving shaft **55** so that the holder **56** is located near the guide rails **3**, and the suction holding assembly **70** is mounted on this suction holding assembly holder **56**.

On the side plate **50**, a pair of timing pulleys **57** and **58** are rotatably provided so that they are located beneath the left and right ends of the Y-direction moving shaft **55**. In addition, two guide rollers **59** and **60** are rotatably provided on the side plate **50** so that the rollers **59** and **60** are positioned between the timing pulleys **57** and **58** and slightly lower than the timing pulleys **57** and **58**.

A motor supporting plate **61** is fastened to the undersurface of the raising-and-lowering plate **36** so as to be located beneath the guide rollers **59** and **60**, and a motor **62** is mounted to this motor supporting plate **61**. A timing pulley **63** is coupled to the output shaft of the motor **62**, and a timing belt **64** is provided on the timing pulleys **57** and **58**, the guide rollers **59** and **60** and the timing pulley **63**. A part of the upper portion of the timing belt **64** which is between the timing pulleys **57** and **58** is fastened to the Y-direction moving shaft holder **54**.

A paper receiving chute **65** is fastened to the upper portion of the bearing holder **33** that is located on the guide rails **3** side, and a paper disposal box holder **67** which holds a paper disposal box **66** is fastened beneath the paper receiving chute **65**.

The structure of the suction holding assembly **70**, which include a suction holder **72**, will be described below with reference to FIGS. **2** through **7**.

As shown in FIGS. **2** and **4**, the suction holder **72** is formed with a mounting plate **71** which is secured to the suction holding assembly holder **56** (see FIG. **1**); and, as best seen in FIG. **2**, two slots **73** which extend in the X direction are formed in this suction holder **72**. In addition, rotation-preventing grooves **74** which are wider than the slots **73** are formed, along the slots **73**, on the undersurface of the suction holder **72**.

Y-direction shaft supporting holders **75** are fastened to both ends (in the X direction) of the suction holder **72**, and each one of a pair of Y-direction shafts **76** is fastened, at its center, to each one of these two Y-direction shaft supporting holders **75**.

Sliding blocks **77**A, **77**B, **78**A and **78**B are slidably fitted over both ends of each of two Y-direction shafts **76** with bearings **79** in between. In addition, fastening holders **80** are fitted over the Y-direction shafts **76** so that the holders **80** are located on the inner sides of the sliding blocks **77**A, **77**B, **78**A and **78**B. In addition, as best seen from FIG. **3**, each of the fastening holders **80** is split into two parts by a slit **81** so that the Y-direction shaft is located in the slit **81**.

The portions of the fastening holders **80** located below the slits **81** are fastened to the respective sliding blocks **77**A, **77**B and **78**A, **78**B by screws **82**. In addition, sliding block fastening screws **83** are engaged with the portions of the sliding blocks **77**A, **77**B and **78**A, **78**B, the portions being located below the slits **81**, so that the portions of the fastening holders **80** above the slits **81** are pressed against the sliding blocks **77**A, **77**B and **78**A, **78**B from above.

Pairs of X-direction guide plates **84**A and **85**A and **84**B and **85**B which extend in the X direction are fastened at both ends thereof to the undersurface of the sliding blocks **77**A and **78**A and of the sliding blocks **77**B and **78**B, respectively, by means of screws **87** (see FIG. **4**) so that guide gaps **86**A and **86**B are formed between the plates **84**A and **85**A and between the plates **84**B and **85**B. Rotation preventing grooves **88**A and **88**B are formed on the inner edges of the

undersurface of the guide plates **84**A and **85**A and of the guide plates **84**B and **85**B.

As seen from FIG. **2**, a vacuum connection block **90** is fastened to one end (left end in FIG. **2**) of the suction holder **72**. The vacuum connecting block **90** is provided with first and second vacuum passages **91** and **92**, which are blind holes. Each one of the vacuum connecters **93** and **94** is attached to the first and second vacuum passages **91** and **92** respectively. These vacuum connecters **93** and **94** are connected to a vacuum pump via pipes and electromagnetic valves (which are not shown).

Four vacuum connection pieces **95** are attached to the surface of the vacuum connection block **90** so that the vacuum connection pieces **95** communicate with the first vacuum passage **91**. Six vacuum connection pieces **96** are attached to the surface of the vacuum connection block **90** so that the vacuum connection pieces **96** communicate with the second vacuum passage **92**.

One lead frame detection terminal **100** and two paper suction nozzles **110** are provided on the suction holder **72** along each one of the slots **73** so that the lead frame detection terminals **100** and paper suction nozzles **110** can slide along the slots **73**. In other words, a total of two lead frame detection terminals **100** and four paper suction nozzles **110** are provided on the suction holder **72**. Furthermore, three lead frame suction nozzles **120** are provided to each pair of the guide plates **84**A and **85**A and the guide plates **84**B and **85**B so that the lead frame suction nozzles **120** can slide and be positionally fixed inside the guide gaps **86**A and **86**B.

The details of the lead frame detection terminals **100**, paper suction nozzles **110** and lead frame suction nozzles **120** are described below.

FIG. **5** shows the details of one of two lead frame detection terminals **100**.

An insulating body **101** is inserted into the corresponding slot **73** of the suction holder **72** so that the insulating body **101** is in contact with the rotation-preventing groove **74**, and a nut **102** is screwed onto a screw part formed on the upper portion of the insulating body **101**. A detection element **104** made of metal is provided in the insulating body **101** with a bush **103** interposed in between so that the detection element **104** is slidable inside the insulating body **101**. Furthermore, the detection element **104** is provided with a spring **106** so that a nut **105** is pressed by the spring **106** against the upper surface of the insulating body **101**. Electrical lines (not shown) are connected to the upper ends of the detection element **104** of each one of two lead frame detection terminals **100**, and these cords are connected to a detector (not shown).

FIG. **6** shows the details of the paper suction nozzles **110**.

In particular, for each one of four (4) paper suction nozzles **110**, a screw pipe **112** which has a vacuum suction pad **111** is inserted into the corresponding slot **73** of the suction holder **72**, and a nut **113** is screwed onto the screw part of the screw pipe **112** so that the nut **113** in inserted into the rotation-preventing groove **74** formed in the undersurface of the suction holder **72**. In addition, a nut **114** is screwed onto the screw pipe **112** from the upper surface of the suction holder **72**. Thus, the screw pipe **112** is fastened to the suction holder **72** by the nut **113** and nut **114**. Total of four screw pipes **112** of these four paper suction nozzles **110** are respectively connected to the four vacuum connection pieces **95** shown in FIG. **2** by pipes (not shown).

FIGS. **6** and **7** show the details of the lead frame suction nozzles **120**.

In each of the lead frame suction nozzle **120**, the screw portion of a holder **121** is passed through one of two guide gaps **86**A and **86**B which are formed by the X-direction guide plates **84**A and **85**A and by the X-direction guide plates **84**B and **85**B, respectively, so that the screw portion of the holder **121** protrudes upward. A nut **122** is screwed onto the screw portion of the holder **121** so as to positionally fasten the holder **121** to the corresponding guide plates **84**A and **85**A and the guide plates **84**B and **85**B. A screw shaft **123** is screwed into the holder **121**, and nuts **124** and **125** are screwed onto the screw shaft **123**. In addition, a bolt **126** is screwed into the nut **125**.

An L-shaped nozzle holder **127** is fitted to the lower end of the screw shaft **123** so that the nozzle holder **127** can be slid up and down. So as to prevent rotation of the nozzle holder **127**, the nozzle holder **127** is, as best seen from FIG. **7**, inserted into a cut-out side surface **128** formed in the lower portion of the holder **121** in such a manner that the nozzle holder **127** is slidable up and down. Furthermore, a spring **130** is mounted between the holder **121** and the nozzle holder **127** so that the nozzle holder **127** is pressed against a stopper **129** on the lower end of the screw shaft **123**. A suction nozzle element **131** is fastened to the tip end of the nozzle holder **127**. Total of six (6) suction nozzle elements **131** of six lead frame suction nozzles **120** are respectively connected to the six vacuum connection pieces **95** shown in FIG. **2**.

With the structure of the lead frame suction nozzles **120** as described above, if the bolt **126** is sufficiently tightened, the nut **125** is fastened to the screw shaft **123**. Then, the nut **124** is loosened and the nut **125** is turned, so that the screw shaft **123** is moved up and down relative to the holder **121**. In other words, since the nozzle holder **127** to which the suction nozzle element **131** is attached is supported by the stopper **129** which is installed on the screw shaft **123**, the suction nozzle element **131** also moves up and down when the nut **125** is turned. In this way, the position of the lower end of the suction nozzle element **131** can be adjusted. Since six lead frame suction nozzles **120** are provided in the suction holding assembly, the positions of the lower ends of the suction nozzle element **131** of all six lead frame suction nozzles **120** are adjusted to the same horizontal plane by means of the operation described above.

After the position of the lower end of each suction nozzle element **131** has been adjusted, the nut **122** is tightened so that the nut **122** presses against the upper surface of the holder **121**, thus fixing the position of the screw shaft **123**.

Next, the method for adjusting the suction holding assembly **70** will be described. FIGS. **2** and **3** show the case in which the largest size lead frame is handled. Upon changes in the width and length of the lead frames **1** due to a change in the type of product to be handled, the positions of the lead frame detection terminals **100**, paper suction nozzles **110** and lead frame suction nozzles **120** are adjusted to as to meet the sizes of the new product (lead frame).

Adjustment in the width-wise direction of the lead frame is described as follows:

Four sliding block fastening screws **83** are loosened so as to bring each pair of sliding blocks **77**A and **77**B and **78**A and **78**B to be movable along the Y-direction shafts **76** towards each other.

The X-direction guide plates **84**A and **85**A attached to the sliding blocks **77**A and **78**A are moved in the direction indicated by arrow E, and the X-direction guide plates **84**B and **85**B attached to the sliding blocks **77**B and **78**B are moved in the direction indicated by arrow F, so

that the suction nozzle elements **131** of the lead frame suction nozzles **120** are positioned at the edge portions of the (new) lead frame **1**, which is to be handled, in the direction of width, i.e., in the Y direction.

The sliding block fastening screws **83** are tightened back, thus narrowing the slits **81** of the fastening holders **80** so that the fastening holders **80** are fastened to the Y-direction shafts **76**.

Adjustment of the paper suction nozzles **110**, the detection terminals **100**, and the lead frame suction nozzles **120** in the length-wise direction of the lead frame (i.e., the dimension of the lead frames **1** in the X direction) is describe as follows:

For each of the paper suction nozzles **110**, as seen from FIG. **6**, the nut **114** is loosened so that the screw pipe **112** can be caused to slide along the slot **73**. After this, the paper suction nozzle **110** is moved along the slots **73**, placed in position which meet the lead frame **1**, and then the nut **114** is tightened back.

For each of the detection terminals **100**, as seen from FIG. **5**, the nut **102** is loosened, thus making it possible to slide the insulating body **101** along the slot **73**. Then, the lead frame detection terminal **110** is moved so that each of the detection terminals **100** is positioned more or less midway between the two paper suction nozzles **110** on either side, and the nut **102** is tightened back.

For each of the lead frame suction nozzles **120**, as seen from FIG. **6**, the nut **122** is loosened, thus making it possible for the holder **121** to slide along one of the slots **86**A and **86**B. The lead frame suction nozzle **120** is moved in the guide gap **86**A or **86**B and placed in positions which fit the lead frame **1**. Afterward, the nut **122** is tightened back.

Next, the operation which removes lead frames **1** from the magazine **4** and places them on the guide rails **3** will be described with reference to FIG. **1**.

With the state illustrated in FIG. **1**, the motor **62** of the suction holding assembly driving device **30** is actuated in the direction indicated by arrow G; as a result, the timing belt **64** is rotated in the direction indicated by arrow H. As a result, the Y-direction moving shaft holders **54** and the guide plate **53** are moved in the direction of arrow H while being guided by the guide rail **52**. In other words, the Y-direction moving shaft **55** and the suction holding assembly holder **56** mounted thereto are moved in the direction of arrow H so that the suction holding assembly **70** is positioned above the magazine **4**.

The air cylinder **41** is next actuated so that the operating rod of the air cylinder **41** is retracted, thus causing the cam **39** to rotate. As a result, the raising-and-lowering plate **36** and the suction holding assembly **70** mounted thereon are lowered via the actuating plate **37**, so that the respective tip portions of the detection elements **104** of the lead frame detection terminals **110**, the vacuum suction pads **111** of the paper suction nozzles **110** and the suction nozzle elements **131** of the lead frame suction nozzles **120** are all positioned slightly below the nozzle suction position **24**, thus causing those tip portions to contact the uppermost lead frame **1** or paper in the magazine **4**.

When the lead frame **1** is present in the uppermost position inside the magazine **4**, and the detection elements **104** of the two lead frame detection terminals **100** contact the lead frame **1**, the detection elements **104** are brought into electrical continuity. Accordingly, a detector (not shown) outputs a signal indicating that the object that is to be held by suction is the lead frame **1**. As a result, vacuum suction is applied to the vacuum connecting element **94**, and this vacuum suction is transmitted to the suction nozzle elements **131** of the six lead frame suction nozzles **120** via the second vacuum passage **92**, pipes (not shown) and vacuum connection pieces **96**, so that the lead frame **1** is held by the suction nozzle elements **131**.

Then, the operating rod of the air cylinder **41** is caused to move outward (i.e., in the opposite direction from that described above) so that the cam **39** rotates reversely, thus causing the actuating plate **37** and raising-and-lowering plate **36** to moved upward. As a result, the suction holding assembly **70** is raised while holding the lead frame **1** by suction.

When the suction holding assembly **70** is raised while holding the lead frame **1** by suction, the motor **20** is driven so that the next uppermost lead frame **1** is positioned in the nozzle suction position **24**.

The motor **62** is caused to rotate in the opposite direction from that described above, so that the timing belt **64** is also moved in the opposite direction from that described above. Since the presence of a lead frame **1** has been detected as described above, the motor **62** is driven until the suction holding assembly **70** is moved above the guide rails **3**.

Next, the operating rod of the air cylinder **41** is retracted so that the actuating plate **37** and raising-and-lowering plate **36** are lowered, thus causing the lead frame **1** held by the suction holding assembly **70** to contact the guide rails **3**. Then, the vacuum of the vacuum connecting element **94**, i.e., the vacuum of the suction nozzle elements **131** of the lead frame suction nozzles **120** is shut off.

The operating rod of the air cylinder **41** is caused to protrude and the motor **62** is rotated in the forward direction, so that the suction holding assembly **70** leaves the lead frame **1** on the guide rails **3** and moves to a position above the magazine **4**.

In cases where paper **2** is present in the uppermost position inside the lead frame magazine **4**, the following paper detection process occurs:

The detection elements **104** of the two lead frame detection terminals **100** comes into contact with the paper **2** when the suction holding assembly **70** is lowered. Accordingly, no electrical continuity is established, and the detector (not shown) outputs a signal indicating that the item that is to be gripped by suction is not a lead frame but a paper **2**. As a result, vacuum suction is applied to the vacuum connecter **93**, and this vacuum suction is transmitted to the vacuum suction pads **111** of the paper suction nozzles **110** via the first vacuum passage **91**, pipes (not shown) and vacuum connection pieces **95**, so that the paper **2** is sucked by the vacuum suction pads **111**.

Next, the air cylinder **41** is actuated so that the suction holding assembly **70** is raised; then, the motor **62** is driven so that the suction holding assembly **70** moves to a position above the paper receiving chute **65**.

After this, the vacuum of the vacuum connecter **93** is shut off, i.e., the vacuum of the vacuum suction pads **111** of the paper suction nozzles **110** is shut off, so that the paper **2** held up to this point by the vacuum suction pads **111** falls into the paper receiving chute **65** and further into the paper disposal box **66**.

The motor **62** is driven so that the suction holding assembly **70** is moved to a position above the magazine **4**. Then, the air cylinder **41** is actuated so that the suction holding assembly **70** is lowered.

As a result of the series of operations described above, the lead frames **1** are moved onto the guide rails **3**, and papers **2** are accomodated in the paper disposal box **66**.

As seen from the above, a plurality of lead frame suction nozzles **120** are disposed in two rows on a suction holder **72** (which is moved in the vertical direction and in the horizontal Y direction which is perpendicular to the X direction which is a lead frame conveying direction on the guide rails **3**) so that both edges of each lead frame (with respect to the direction of width of the lead frame) are held by suction; accordingly, no scratching of the lead surfaces of the lead frames **1** would occur, and the lead frames **1** can be stably held by suction.

Furthermore, the plurality of lead frame suction nozzles **120** installed in two rows are provided so that the positions of these nozzles **120** in the direction of width of the lead frame can be adjusted by moving the respective rows of lead frame suction nozzles in the direction of width of the lead frame; and in addition, the plurality of lead frame suction nozzles **120** in each row are provided so that the positions of the lead frame suction nozzles in the direction of the length of the lead frame can be adjusted by moving the lead frame suction nozzles in the direction of length of the lead frame. Accordingly, various types of lead frames can be handled, and therefore, the device has all-purpose utility.

In the above embodiment, the lead frames **1** are accommodated in the magazine **4** with papers **2** in between. However, the invention is applicable to a system in which only stacked lead frames are accommodated in the magazine and no papers are between the lead frames. In this, it goes without saying that the lead frame detection terminals **100** and paper suction nozzles **110** are unnecessary.

As seen from the above, according to the present invention a plurality of lead frame suction nozzles are provided in two rows on a suction holding body which is moved in the vertical direction and in the horizontal Y direction which is perpendicular to the horizontal X-direction (this X-direction being the conveying direction of the guide rails) so that both edge portions of each lead frame are held by suction from the lead frame suction nozzles. In addition, since the plurality of lead frame suction nozzles provided in two rows are provided so that the positions of the lead frame suction nozzles in the direction of width and length of the lead frame can be adjusted by moving the respective rows of lead frame suction nozzles in the direction of width of the lead frame and in the direction of length of the lead frame, various types of lead frames can be handled.

We claim:

1. A suction holding assembly for lead frames which holds lead frames accommodated in a lead frame magazine by suction and places said lead frames on guide rails and said lead frames have a length and a width and edge portions, comprising a suction holder, a plurality of lead frame suction nozzles disposed in at least two parallel rows on said suction holder, and means for moving said suction holder in a vertical direction and in a horizontal Y direction which is perpendicular to an X direction that is a conveying direction of said guide rails so that said edge portions of each lead frame with respect to a direction of one of said length and width of said lead frame are held by suction.

2. A suction holding assembly according to claim **1**, wherein said plurality of lead frame suction nozzles installed in at least two parallel rows are installed so that positions of said lead frame suction nozzles in a direction of width of said lead frame can be adjusted by moving of respective rows of lead frame suction nozzles in said direction of said width of said lead frame, and said plurality of lead frame suction nozzles in each row are installed so that positions of said lead frame suction nozzles in a direction of length of said lead frame can be adjusted by moving said lead frame suction nozzles in said direction of length of said lead frame.

3. A suction holding assembly comprising:

Y-direction shafts which extend in a horizontal Y direction are respectively fastened to both ends of a suction holder in an X-direction which is perpendicular to said Y-direction;

sliding blocks are installed on both ends of each of said Y-direction shafts so that said sliding blocks can slide on said Y-direction shafts and positionally fastened to said Y-direction shafts;

X-direction guide plates which extend in the X direction fastened at both ends thereof to each of said sliding blocks which face each other in said X direction; and

a plurality of lead frame suction nozzles slidably installed on said X-direction guide plates so that said lead frame suction nozzles are positionally fixed to said X-direction guide plates such that said plurality of lead frame suction nozzles are mounted in at least two parallel rows.

4. A lead frame suction holding assembly which removes lead frames from a lead frame magazine and places said lead frames on guide rails by suction, each of said lead frames having side portions, said assembly comprising a suction holder, a plurality of lead frame suction nozzles disposed in at least two parallel rows on said suction holder so that said side portions of said lead frame are held by suction created by said lead frame suction nozzles, and wherein said suction holder is movable in a vertical direction and in one horizontal direction which is perpendicular to a conveying direction of said guide rails.

5. A lead frame suction holding assembly according to claim **4**, wherein said plurality of lead frame suction nozzles disposed in two rows are mounted so that one of said two rows of said lead frame suction nozzles is movable toward and away from an other of said two rows of said lead frame suction nozzles and so that said lead frame suction nozzles of each one of said two rows can be moved closer to and away from the other.

6. A lead frame suction holding assembly according to claim **5**, further comprising a lead frame detection terminal and a paper holding nozzle which are provided between said two rows of said lead frame suction nozzles.

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